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**Quantum Entangled Dark Solitons in the Bose-Hubbard Model**[1]

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— We investigate the existence and stability of dark quantum solitons formed by Bose-Einstein condensates in a one-dimensional optical lattice. This is done by employing a one-level Bose-Hubbard model and simulating the real time dynamics of the condensate using both exact numerical techniques and Vidal's simulation method, i.e., Time Evolving Block Decimation. For the initial condition, we take a Gutzwiller ansatz wavefunction with on-site truncated coherent states and build a direct quantum analog to the soliton solutions of the Discrete Nonlinear Schrödinger Equation. The stability of these solutions are then analyzed in the Bose-Hubbard model for different parameter regimes. We are especially interested in the behavior of dark solitons near the Mott-superfluid border. Also, we quantitatively examine the effect of quantum entanglement on dark quantum soliton stability.

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